

February 2, 2018



Chairman John Thune
United States Senate
Committee on Commerce, Science, and Transportation
Washington, D.C. 20510

Dear Chairman Thune,

Thank you for your inquiry regarding iPhones, batteries, and performance. We welcome this opportunity to provide additional information and clarity on this issue and to answer your questions.

Apple's recent actions related to performance of iPhones with older batteries were based on providing our customers with the best experience. In this case, that meant preventing iPhone 6 or later models from unexpectedly shutting down under certain circumstances. As we said publicly, we have never — and would never — do anything to intentionally shorten the life of any Apple product or degrade the user experience to drive customer upgrades. Our goal has always been to create products that our customers love, and making iPhones last as long as possible is an important part of that.

We want to provide a timeline of key events that led to where we are today, as well as some technical background that we hope you will find helpful, in addition to the answers to your questions.

Timeline

In fall 2016, we received reports from a few iPhone customers whose devices were experiencing unexpected shutdowns. We found that a small number of iPhone 6s devices had batteries that contained a battery component that was exposed to controlled ambient air longer than it should have been before being assembled into battery packs. We set up a program to replace those batteries for affected iPhone 6s owners. We also discovered that other iPhones, under certain circumstances, were experiencing unexpected shutdowns.

To learn more, we did a software update that included diagnostics to help us understand whether we needed to improve the algorithms used to manage battery performance and shutdowns. An iPhone is actually designed to shut down automatically under certain conditions, such as extremely cold temperature. To an iPhone user, some of those shutdowns might seem unexpected, but they are designed to protect the device's electronics from low voltage.

After gathering and analyzing data, we issued the iOS 10.2.1 software update in January, 2017, for iPhone 6, iPhone 6 Plus, iPhone 6s, iPhone 6s Plus, and iPhone SE.



Then we looked at the diagnostic data made available by the update, and it indicated that the rate of unexpected shutdowns was greatly reduced for iPhone 6 and iPhone 6s owners. In February, 2017, we updated our iOS 10.2.1 ReadMe notes to let customers know the update “improves power management during peak workloads to avoid unexpected shutdowns.” We also provided a statement to several press outlets and said that we were seeing positive results from the software update. We extended the same support for iPhone 7 and iPhone 7 Plus through iOS 11.2 in December, 2017.

Technical Background

As lithium-ion batteries chemically age, their ability to hold a charge diminishes. This may result in shorter amounts of time before a device needs to be recharged. In addition, a battery’s ability to provide power quickly may decrease. In order for a phone to function properly, the electronics must be able to draw on instantaneous power from the battery. One attribute that affects this instantaneous power delivery is the battery’s impedance. A battery with a high impedance is unable to provide power quickly enough to the system that needs it. A battery’s impedance can increase if a battery has a higher chemical age. A battery’s impedance will temporarily increase at a low state of charge and in a cold temperature environment. When coupled with a higher chemical age, the impedance increase will be more significant. These are characteristics of battery chemistry that are common to all lithium-ion batteries in the industry.

We do not want our customers to experience interruptions in the use of their iPhones, whether that is making an emergency phone call, taking a picture, sharing a post, or watching the end of a close game. To address the issue of unexpected shutdowns, we are constantly working to improve battery performance. We also have developed software that dynamically manages power usage when, and only when, an iPhone is at risk of an unexpected shutdown. This power management software helps keep iPhones on when they otherwise might turn off, by balancing the demand for power with the available supply of it.

While our intention has been to give our customers the best products and the best experiences, we have apologized to our customers and, as described here, have taken a number of steps to address the complaints.

Your questions and our answers are below.

1. Did Apple notify its customers before it released this software update feature to throttle back processing performance for its iPhone 6, iPhone 6S, iPhone SE, and iPhone 7 with iOS 11.2? If so, when and how did Apple notify its customers?

As explained above, we first delivered this power management feature to iPhone 6, iPhone 6 Plus, iPhone 6s, iPhone 6s Plus, and iPhone SE as part of iOS 10.2.1, in



January, 2017. Once we verified that the feature was effective in avoiding unexpected shutdowns, we updated the iOS 10.2.1 ReadMe notes in February, 2017. Specifically, the iOS 10.2.1 ReadMe notes said that this update “also improves power management during peak workloads to avoid unexpected shutdowns on iPhone.”

We also made this statement to Fortune, TechCrunch, and several other media outlets on February 23, 2017:

With iOS 10.2.1, Apple made improvements to reduce occurrences of unexpected shutdowns that a small number of users were experiencing with their iPhone. iOS 10.2.1 already has over 50% of active iOS devices upgraded and the diagnostic data we’ve received from upgraders shows that for this small percentage of users experiencing the issue, we’re seeing a more than 80% reduction in iPhone 6s and over 70% reduction on iPhone 6 of devices unexpectedly shutting down.

We also added the ability for the phone to restart without needing to connect to power, if a user still encounters an unexpected shutdown. It is important to note that these unexpected shutdowns are not a safety issue, but we understand it can be an inconvenience and wanted to fix the issue as quickly as possible. If a customer has any issues with their device they can contact AppleCare.

As noted, the software update successfully reduced the incidence of unexpected shutdowns and that customers’ experience with it was positive. We deployed the same software update to iPhone 7 and iPhone 7 Plus through iOS 11.2 in December, 2017.

2. Did Apple offer its customers the option of declining the software update feature to throttle back processing performance? If so, how? If not, why not?

Our software updates are designed to provide new features and capabilities as well as fixes in order to improve the customer experience. All of our software updates are optional and the customer decides whether to update or not. We do not provide customers the option to install some features but not others. However, as we recently announced, iOS 11.3 will add new features to give customers greater visibility into the health of their iPhone’s battery. The new software update will recommend if a battery needs to be serviced. It also will allow customers to see whether the power management feature that dynamically manages maximum performance to prevent unexpected shutdowns is on, and they can choose to turn it off.

3. Did Apple release a similar software update feature to throttle back processing performance for earlier models, such as the iPhone 4, iPhone 5, and iPhone 5S? If so,



when? Did Apple notify its customers before doing so? If so, when and how did Apple notify its customers?

Older iPhone models such as iPhone 5s have different system power demands than newer iPhone models and so did not experience the same issue.

4. Does Apple plan to release a similar software update feature to throttle back processing performance for newer phone models? What notice does it plan to provide to customers before doing so?

All iPhone models have basic performance management to ensure that the battery and overall system operates as designed and internal components are protected. And, in the case of hot temperature, the performance management ensures that the device stays within safety limits. Such basic performance management is required for safety and expected function, and it cannot be turned off.

iPhone 8, iPhone 8 Plus, and iPhone X models include hardware updates that allow a more advanced performance management system that more precisely allows iOS to anticipate and avoid an unexpected shutdown.

5. Has Apple tracked consumer complaints about processing performance that are likely to be attributable to this software update throttling feature? If so, how many such complaints has Apple received and how has Apple addressed such complaints?

Apple always monitors customer feedback on a constant basis.

6. How did Apple notify its customers regarding the option of replacing the iPhone battery?

We notified the public of this offer through a December 28, 2017, message to our customers right on the front page of the Apple website, and the offer also has been widely reported in the press. We are offering out-of-warranty replacement batteries for \$29 to anyone with an iPhone 6 or later, regardless of whether they have experienced performance issues.

7. Apple is reducing the price of an out-of-warranty iPhone battery replacement to \$29 for anyone with an iPhone 6 or later. In addition, Apple has issued an apology to consumers for the way it handled performance for iPhones with older batteries and how Apple communicated that process. How did Apple arrive at the \$29 battery replacement figure? Did the company consider alternative plans to address the issue, such as providing a replacement battery free of charge to affected consumers?



We wanted the battery replacement offer to be far below the cost of our regular price for an out-of-warranty replacement. And we are seeing strong demand for it. Anyone who has an iPhone 6 or later can make arrangements for a battery replacement at an Apple Store or an Apple Authorized Service Provider by using the Apple Customer Apple Support page. This offer is available through end end of December, 2018, so customers have plenty of time to take advantage of it.

8. Has Apple explored whether consumers who paid the full, non-discounted price for a replacement battery in an effort to restore performance should be allowed to seek a rebate for some of the purchase price?

Yes, we are exploring this and will update you accordingly.

We appreciate your attention to this issue and the opportunity to address your questions.

Sincerely,

A handwritten signature in black ink, which appears to read "Cynthia C. Hogan", is located below the word "Sincerely,".

Cynthia C. Hogan
Vice President for Public Policy, Americas
Apple